# Product Manual

# 232-ATSC+

## HDTV Tuner
## August 15, 2011

S12 Control Version 4.10
HD Processor Version 3.07

DOLBY DIGITAL

Contemporary Research

17630 Davenport Road, Suite 113 • Dallas, TX 75252
Phone: 972-931-2728 • Toll-Free: 888-972-2728 • Fax: 972-931-2765
E-Mail: Sales@crwww.com • Website: www.crwww.com

# Table of Contents


**Overview** ..... **3**
**Specifications** ..... **4**
Physical ..... 4
Front Panel ..... 4
Tuning ..... 5
Captioning ..... 5
Includes ..... 5
Options ..... 5
Trademarks ..... 5
**Quick Setup** ..... **6**
Tuner Setup – Front-panel LED menus ..... 6
Channel Tuning – On-Screen menus ..... 6
**Troubleshooting** ..... **7**
**Front Panel Setup** ..... **9**
**HD2-RC IR Remote** ..... **10**
**On-Screen Menus** ..... **11**
Main Menu ..... 11
Channel Menus ..... 11
Caption Menus ..... 13
V-Chip Settings Menus ..... 13
Setup Menus ..... 14
Pop-Up Menus ..... 15
**RS-232 Control Protocol** ..... **17**
Control Commands ..... 18
Terminal Communication Commands ..... 19
HD2-RC Remote Emulation ..... 20
**Response Strings** ..... **21**
Response Strings ..... 21
**RS-232 Cable Connections** ..... **22**
**Rack Mounting** ..... **23**
**Safety Instructions** ..... **24**
**Limited Warranty** ..... **25**

# Overview

The 232-ATSC+ HDTV Tuner includes all the proven performance of the 232-ATSC, plus new features requested by AV integrators:

- Lower profile enclosure - four tuners can fit into a 3RU space
- Simpler setup - all on-screen and front-panel menus can be accessed from the front panel - no IR remote needed
- SmartScan technology eliminates encrypted channels during the scanning process
- More energy efficient - draws almost a third less power
- Compatible - includes all firmware options of the 232-ATSC, no change in control commands

The 232-ATSC+ HDTV Tuner is an integrator-friendly universal HDTV tuner, controllable via two-way RS-232 and discrete IR commands. Able to fit two-across in a 2RU or 1.5 RU rack space, the compact tuner outputs HDMI and composite video simultaneously, as well as either RBGHV or Component. NTSC broadcasts are upscaled for HD display. Digital audio is available from HDMI, coax, and optical connections, as well as variable-level stereo audio. Setup is a snap, employing on-screen menus, included IR remote, front-panel programming, and RS-232 control commands.

- Tunes ATSC off-air, clear QAM cable, and analog channels
- Always-active HDMI and composite video, as well as stereo, and digital coax and TOSlink optical audio ports
- VGA or Component outputs switchable from front-panel settings or RS-232 control
- Dolby® 5.1 or PCM/Variable PCM digital audio formats for digital audio ports and HDMI
- Front-panel and onscreen menus for tuner setup and scanning, new buttons eliminate need for IR remote for setup
- Supports dual Air/Cable tuning with optional RF-AB switch
- Analog and digital closed captioning
- Upscales SD and analog channels
- Rack-mountable in 2RU or 1.5RU, two across
- Full ASCII 2-way RS-232 commands, AMX, Crestron, and RTI modules available, discrete IR commands
- RS-232 can be daisy-chained to control up to 9 tuners from a single RS-232 port
- Works with free Tuner Helper control panel/setup software, operates over RS-232 or Ethernet with IP-232 Interface
- Field updatable for control and HD processing firmware
- Green Machine - consumes less power than previous 232-ATSC, meets ROHS and California energy-saving standards
- Includes HD2-RC IR remote and 12 VDC power supply
- Options for single and dual rack mounts, pole-mounting, stereo mixer/amplifier, external RF-AB RF switch
- New – Free option to drive 2-3 232-ATSC+ tuners from a 12 VDC 4A power supply. Check website or CR Sales for info.

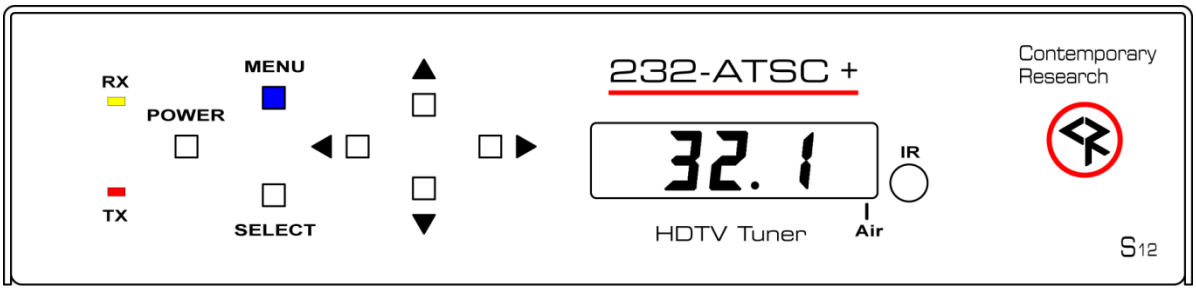
**Firmware**
V3.07 HD Firmware - Line 21 captioning from analog channels, stays on sub-channel if the signal drops out
V4.10 SF firmware adds Quick Setup using Select and Left/Right arrow keys

# Specifications

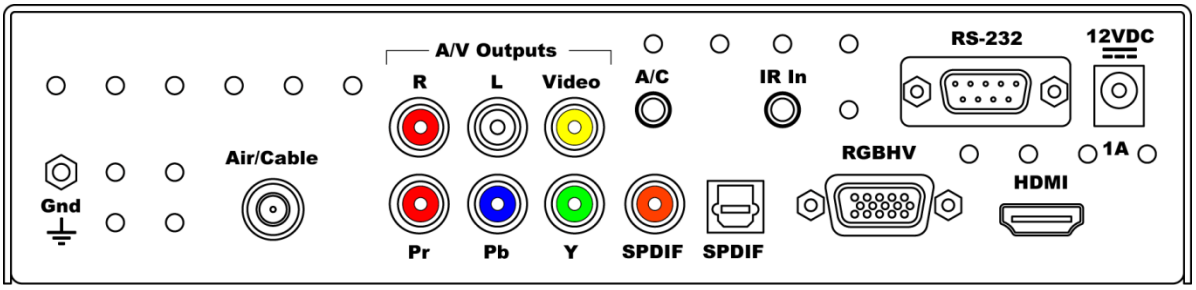
## Physical

**Size (HWD):** 8.5” [216mm] wide x 2.0” [51mm] height (1.5 RU) x 8.0” [203mm] deep
**Weight:** 1.94 lbs [890 g]
**Enclosure**: Steel with black powder coat paint
**Mounting**: 2/1.5RU Rack mounting for one or two units side-by-side optional (RK1/2-HD+, RK2S-HD+)

## Front Panel




**Display**: Red LED Channel Display, dot separated major and minor channel numbers, dot at end indicates Off-Air tuning
**IR:** IR sensor
**Control:** Power, Menu, and Select buttons, navigation using Up and Down (Channel Up and Down) buttons Left and Right (Volume Down and Up) buttons
**LEDs:** RS-232 RX (Yellow), RS-232 TX (Red), Power (Green)




**Air/Cable:** ‘F’, female, 75 ohm impedance, -10 to 15 VDC typical
Supports dual Cable and Air tuning with optional RF-AB RF A-B Switch
**Video Output:** Simultaneous HDM and NTSC video, switch between RGB and Component
**Video Out:** RCA composite video output, 1V p-p at 75 ohm impedance, 480i
**Component Out**: 3 RCA Y, Pr, Pb outputs (1080i/720p/480p/480i)
**RGB Out:** RGBHV DB-15 female (1080i/720p/480p, 59.95 Hz)
**HDMI:** HDMI receptacle, Type A, HD video and digital audio, version 1.3 (1080i/720p/480p), HDCP
Use PCM mode if HDMI audio connection is used to most displays (not all have Dolby)
**Audio Output:** Simultaneous HDMI, Coax, Optical, and Stereo
**Digital Audio SPDIF:** Coax and TOSlink optical output, Dolby 5.1 AC3/PCM/Variable PCM
**Analog Audio Out:** Stereo RCA audio, Mono, Stereo, or SAP, variable level
**RS-232 Control**: DB-9 male, RS-232 data link to control system or PC, up to 9 tuners, 300-19,200 baud
**IR In:** 3.5mm stereo jack for optional IR-RXC IR Receiver
Sleeve= DC power+ from power jack input, limited to less than 100mA
Ring=DC power– (GND)
Tip= IR data signal
**Power In:** 2.1mm coaxial jack (inside center conductor positive)
1 A maximum, 11.5 to 15 VDC, 12 VDC typical

## Tuning

**Frequency Range:** ATSC and Clear QAM (cable) television 55.25 to 801.25 MHz
**TV System:** ATSC, NTSC, Cable, and Clear QAM (1080i/720p/480p/480i)
**Tuning:** Off-air 2-69 (NTSC and 8-VSB) and CATV 1-135 (Analog, 64QAM, 256QAM, 8-VSB)
**Aspect Ratio:** 4:3, 16:9 (Digital), 4:3, 16:9, Zoom (Analog channels)
**Captioning:** DTV and analog, set by program or customized for size, font and display attributes
**Lock**: Parental option for channels and/or rating

## Captioning

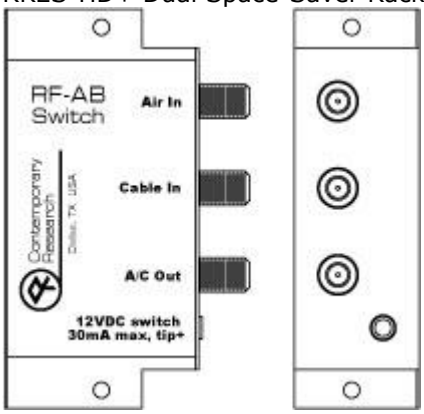
**On-Screen**: Displays on-screen analog and digital captioning on all video ports.
**Captioning Data:** HDMI, RGB, and Component ports don't have the ability to carry captioning data. Captioning data from analog and digital channels will be expressed as Line 21 captioning on the composite video port.

## Includes

HD2-RC IR Tuner Remote, 4 AAA batteries
Power Supply, 1.5A maximum, 12 VDC
PS12-4Y 4A power supply with Y cable to drive 2-3 tuners (free at time of order)

## Options

RK1-HD+ Single Rack Kit, 2RU
RK2-HD+ Dual Rack Kit, 2RU
RK2S-HD+ Dual Space-Saver Rack, 1.5RU (reverse mount to stack)




RF-AB RF A-B Switch (January 2011), self-terminating, included 1/8" cable connects to A/C DC output on tuner
IR-RXC External IR Receiver
CC-COM RS-232 Cable

## Trademarks

- VGA and XGA are trademarks of International Business Machines
- SVGA is a trademark of the Video Electronics Standard Association
- HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

DOLBY DIGITAL Manufactured under license from Dolby Laboratories, Dolby and the double-D symbol are trademarks of Laboratories

# Quick Setup

While there is a full list of hidden Front Panel setup menus, we've created a simple process for setup that should speed up the process.

### Tuner Setup – Front-panel Quick Setup

| | |
|---|---|
| RGB or Component out | Hold down SELECT and press Left Arrow (Volume Down) to switch between RGB and YPbPr outputs – the tuner's LED will show the current status. |
| HD Resolution | Hold down SELECT and click Right Arrow (Volume Up) to step through 1080i, 720p, 480p, and 480i resolution. |
| Air or Cable Tuning | Press the two Channel Up/Down buttons together. Watch the LED next to the channel ID light for AIR mode. Note – to tune both Air and Cable feeds, the tuner needs the optional RF-AB A/B Switch. |

### Channel Tuning – On-Screen menus

| | |
|---|---|
| Scan Channels | Press Blue MENU button, Channel, Auto Scan, then type - usually Cable Auto for cable, Air for off-air channels. The tuner will automatically delete encrypted Cable programs. Wait for the tuner to finish analog scanning, then it will re-scan channels for digital. Press SELECT when tuning analog to skip to scanning for only digital channels. |
| Audio | Press Blue MENU button, Setup, Digital Output, then Dolby, PCM or PCM Variable. If you get a "motorboat" sound for digital sound, switch to PCM. |
| Screen | Press Blue MENU button, Setup, Screen Format and select between 4:3, 16:9 and Zoom options. Stores two different options for digital and analog channels. Options vary in analog and digital, and the channel itself may restrict your options. You can also use the RATIO button on your remote. |

# Troubleshooting

## TUNING CABLE CHANNELS

**Tip:** The 232-ATSC+ will skip encrypted channels automatically when you activate a channel scan

**Tip:** You can skip scanning analog channels by pressing **Select** after you start the scan.

***Symptom: Channel ID is in XX-XX form, not cable box Guide form***

- Cable boxes translate the actual channel #s into a virtual Channel Guide, using channels 2 – 900, or more.
- The actual (physical) channels have IDs in XXX-XX form, just like off-air channels. Non-cable HDTV tuners like the ATSC or LCD TVs don't provide Guide features, so the channels will be displayed in their native, physical major-minor channel form.
- Some cable companies are using a useful format – the cable channels will have a single virtual channel that is the same as the Guide, and local TV channels may use the same virtual major-minor listing as the off-air channel.
- Some cable franchisees have a listing by physical channel, many do not. You can press the INFO button on the HD2-RC remote to view the channel name.

## NO COMPONENT OR RGB VIDEO

***Symptom: No Component or RGB Video***

The RGB and Component outputs are switchable, and the tuner ships set to RGB. Use Front Panel Mode, next section to switch the HD analog video to Component. Use method on page 6, or below for older tuners:

- Hold Select, press Menu on the tuner, let go. Air LED flashes, display shows 0.N (0-3)
- Press Arrow Left to 48.0 (RGB)
- Press Arrow Up to 48.2 (Component)

***Symptom: No RGB Video***
Either the unit was switched to Component (see above and change back to RGB), or the RGB input of the display can't handle the default 1080i setting. Use method on page 6, or below for older tuners:

- Hold Select, press Menu on the tuner, let go. Air LED flashes, display shows 0.N (0-3
- Press Arrow Left to 49.0 (1080i)
- Press Arrow Up to 49.1 (720p), 49.2(480p, or 49.3 (480i)

If the display can't handle any setting, use HDMI or Component, or use a small scaler, such as the TV One C2-400 or similar than can accept an HD RGB signal and convert to a PC widescreen resolution.

**POWER/ NO VIDEO or AUDIO**

**Symptom: Tuner cycles power and LEDs**

Power supply is not providing enough amps of power (greater than 1 A). If you're replacing an old CR analog tuner, the old power supply is 500 mA, and will cause the "power cycle" effect. Use the power supply that came with the tuner, or call to order a new one.

**Symptom: Tuner appears to be on, channel display is lit, but unresponsive, no video/audio out**

- If you have other units, swap the power supplies.
- There is a problem internally, call CR for a repair RMA

## HDMI

***Symptom: No Video or Signal***

- Most monitors accept HDMI in the RGB and Component color space, but there are exceptions. Try switching from RGB to Component (Front panel mode 48).
- Switch between 720p and 1080i, or down to 480P or 480i for old DVI sets. (Front panel mode 49)
- If you're connecting via a Cat5 interface, HDMI receiver, or switcher, some delay the HDCP signal slightly out of range. Call CR Support on how to extend the delay on HDMI.

***Symptom: No audio or fluttering sound in display speakers connected via HDMI***

Change ATSC digital audio to PCM or PCM variable (most displays do not use Dolby 5.1)

## RGB/Component

***Symptom: No RGB or Component Video output***

Check the RGB or Component output setting in Front Panel mode 48 (48.0 is RGB, 48.2 is Component).

***Symptom: No output display on VGA input***

Some monitors or projectors do not support 1080i or 720P operation on the RGB port. Set resolution in Front Panel mode 49 (49.2 for 480P).

***Symptom: Scan or "fluttery" lines at top of VGA video***

Use the RS-232 Overscan command, D4, on page 19. What you're seeing is the data portion of the video. Adding a bit more overscan will eliminate the lines at the top.

## Composite Video

***Symptom: Composite video out has small image in 16:9 setting, analog channels***

- For a 4:3 set, tune to an analog channel and press RATIO on the remote to set to 16:9. Image will fill left to right, you'll always have a black band top and bottom.
- Set to 4:3 if you're only feeding video to 4:3 TVs.
- Set output ratio on a digital channel as well - this a different setting than for analog channels.
- If the tuner is used for 16:9 displays and analog TVs, choose the best setting for the widescreen, and the NTSC will have to be a compromise. Most of the time, setting the RATIO while tuned to an analog channel and again for a digital channel will provide the best result.

## IR Control

***Symptom: IR remote won't control tuner***

Hold down IR remote **Select**, press **9**, and release both. Front-panel setting should be **15.9**. In addition, check if the remote works when the lights are off. Some energy-saving fluorescent lights produce interference at our IR frequency (57 Hz). Try to cover the IR sensor so the lights don't affect operation, or add the IR-RXC External IR Sensor. It's easier to hide and tilt the sensor to help with reception, and you can try Select and 4 to use the lower IR frequency (the RXC has both types of sensors).

## Captioning on Video Outputs

***Symptom: Video out does not include captioning data***

The 232-ATSC+ provides on-screen captioning on all ports. No captioning data is carried on any HD port (HDMI, RGB, and Component standards do not support carrying captioning data). However, the composite video output does carry Line 21 captioning data when tuned to either an analog or digital channel.

# Front Panel Setup

**IR Menu Control –** Click **Menu** button to access on-screen menus.

**Quick Setup (232-ATSC+ V4.1 firmware)** – Hold down Select, then click the left arrow to select RGB or Component output. Hold down Select, then click Right Arrow to cycle through 1080i, 720p, 480p and 480i.

**Front Panel Programming –** Hold down **Select**, then Click **Menu** and release both**.** You should see 0.0 (or 0.1 – 0-4). Use Left and Right arrows to step through options, Up and Down to change parameters. No need to press **Select**, tuner will switch between parameters instantly as you use the left, right arrows.

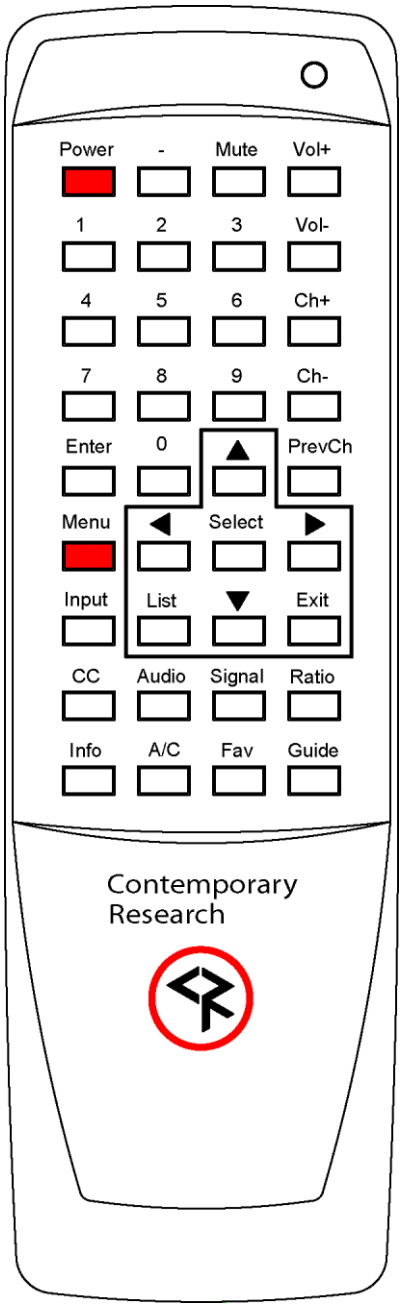
To Exit the Front Panel Mode, click **Menu.**

The older sequence for FP mode is supported as well. When tuner is on, hold down Power, then click the Right arrow (Volume Up). Click **Power** or **Menu** to exit the mode.

| Mode | | Parameters |
|---|---|---|
| RF Tune | **0.0** | 0=CATV (Default) - Switches tuner to Cable, sets Scan mode (See mode 6)<br>1=Off-Air - Switches tuner to Air, sets for Off-Air channel scan<br>2=IRC - Switches tuner to Cable, sets Scan mode<br>3=HRC - Switches tuner to Cable, sets Scan mode<br>4=Cable Auto - Switches tuner to Cable, sets Scan mode |
| Baud Rate | **1.1**<br>**1.2**<br>**1.3**<br>**1.4**<br>**1.5**<br>**1.6**<br>**1.7** | 300<br>600<br>1200<br>2400<br>4800<br>9600<br>19200 |
| Unit Number | **2.1** | 1-9, default is 1 |
| Not Used | **3.0** | |
| Panel Lockout | **4.0**<br>**4.1**<br>**4.2**<br>**4.3**<br>**4.4**<br>**4.5**<br>**4.6**<br>**4.7** | None<br>Channel up/dwn<br>Volume up/dwn<br>Channel & Volume up/dwn<br>Power<br>Channel up/dwn & Power<br>Volume up/dwn & Power<br>All |
| Power-up Volume | **5.0** | 0-63 |
| Firmware Version | **6.17** | Ex: Version 1.7 – Other options:<br>Hold Channel Up, then Power to restore tuner to default settings<br>Hold down Up and Down (Channel) arrows, then press Power to scan channels, see Mode 0 to set Air and Cable before you scan<br>To check HD firmware, use the remote to select Menu, Captions, then Version |
| Captions | **10.0** | 0= Captioning off (default), 1= Captioning on |
| Caption Mode | **11.1**<br>**11.2**<br>**11.3**<br>**11.4**<br>**11.X** | 1=Caption 1 (default)<br>2=Caption 2<br>3=Caption 3<br>4=Caption 4<br>5-8= Text 1-4 (rarely used) |
| Video Detect | **12.3** | No AV mute (fixed) |
| AV Status | **13.0** | No AV status (default) |
| Label Mode | **14.2** | Numeric (fixed) |
| IR Receive | **15.9** | 0= Off, 9=Receive IR |
| Not Used | **16.0** | |
| Digital Captions | **17.1** | 1-6, Default is 1 |
| Digital Audio | **47.0**<br>**47.1**<br>**47.2** | 0 = AC-3– Dolby 5.1 (Default)<br>1 = PCM (use this or Variable for audio through HDMI)<br>2 = PCM Variable |
| HD Output | **48.0**<br>**48.2** | RGB (Default)<br>Component |
| HD Format | **49.0**<br>**49.1**<br>**49.2**<br>**49.3** | 0=1080i (Default)<br>1=720p<br>2=480p<br>3=480i |

# HD2-RC IR Remote

The HD2-RC IR Remote included with the 232-ATSC+ can be used to setup the tuner and for daily operation. All of the functions on the remote have equivalent commands in RS-232, Ethernet, and Wired IR formats. In addition, the 232-ATSC+ front panel buttons can perform Power, Channel, and Volume control.




**Power**
Turns tuner on and off. Discrete on and off IR commands are available as well.

**Volume Control**
Use the **Vol+**, **Vol-** and **Mute** buttons.

**Channel Selection**
The key change in digital tuning is the need to add a dash (**-**) and number after the traditional channel number. Analog channels are accessed using XX-0, digital channels using XX-1 (or -2, -3, etc).

**Ch+, Ch- and PrevCh** can be used to access and recall channels.

**Menu Operation**
Press Menu to access the on-screen menus.

- Use the directional **Arrows**, **Select** and **Exit** to navigate the menus.
- **List** displays the list of all channels, arrow keys add/remove channels, set Favorite Channel list
- **Exit** steps backwards out of menus
- **Enter** selects menu choice

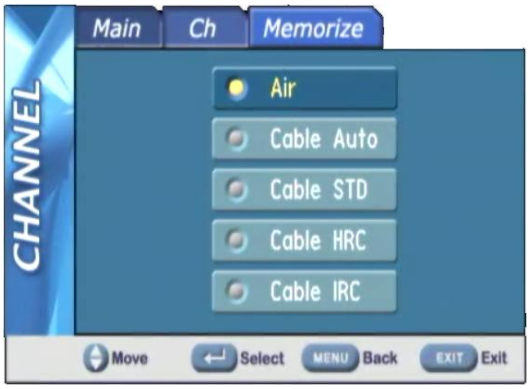
**Special Functions**

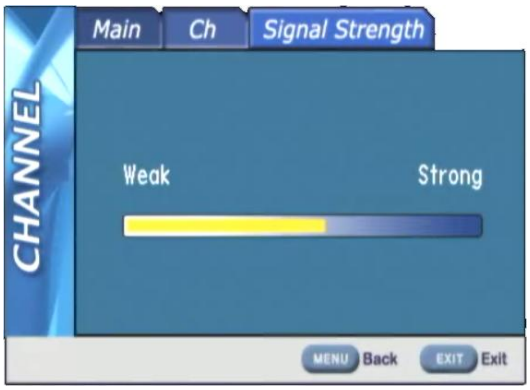
- **CC** steps through available closed-captioning options
- **Audio** selects audio and SAP modes
- **Signal** displays channel signal level
- **Ratio** steps through aspect ratios, options depend on channel and output types
- **Info** launches on-screen information window
- **A/C** selects Air or Cable tuning
- **Fav** Displays list of favorite channels
- **Guide** displays on-screen Guide

Features of many of the Special Function commands depend on whether the current channel is analog or digital.

Tip: The output rules behave differently for digital and analog channels. When you set up the tuner, use the RATIO button to set image output for a digital channel, then tune to an analog channel and set that to 16:9 or 4:3. The same rule applies to the Menu/Setup/Screen Format menus. Set for analog and digital.

# On-Screen Menus

| **Main Menu** | |
|---|---|
| | Selects sub-menus.<br>• Arrow keys highlight option<br>• Select (or Enter) chooses option<br>• Menu steps back or exits menus<br>• Exit exits all menus<br>• Some options are only available if you are currently tuned to an analog or digital channel |
| **Channel Menus** | |
| | Sub-Menu for Channels offers options for:<br>• **Channel Auto-Scan**<br>• **Favorite Channel Selection**<br>• **Add/Delete Channels**<br>• **Fine Tune** (If tuned to an analog channel)<br>• **Signal Strength Meter** |
| ***Auto-Scan***<br>  | Starts scan of analog and digital channels for:<br>• **Air** – looks for NTSC and ATSC channels<br>• **Cable Auto** – looks for analog and digital QAM cable channels, as well as all frequency plans<br>• **Cable STD** - standard cable spacing<br>• **Cable HRC** – HRC cable spacing<br>• **Cable IRC** – IRC cable spacing<br><br>***Tip*:**<br>Normally, use Auto. Most cable channels will be in standard frequencies. If all the channels tune in STD but channels 5 and 6, scan for IRC. If few channels can be found, scan for HRC. |

| | |
|---|---|
| ***Favorite Channels***<br> | Menu is also displayed from the List command, selects channels advanced by the FAV favorite channel command.<br><br>Use the Up, Down arrows to move through the list, press Select to add a channel to Favorites. |
| ***Channel Add/Delete***<br> | This menu can add or delete a channel accessed from Channel Up and Down.<br><br>You can tune to a channel you want to delete, then press Menu/Channel/Add-Delete. Press Select to delete the channel. You can also keep the page on screen as you step through channels, adding and deleting as desired. If the channel has a good signal, it will be displayed in the background.<br><br>Note that HDTV channels are broadcast on UHF frequencies. The Add/Delete will show the name of the digital channel, as well as the actual UHF channel used for broadcasting.<br><br>You can delete one of a digital channel's sub-channels without affecting the others. |
| ***Signal Strength***<br>  | This page also displays from the Signal remote command. The graphic shows the current signal strength, and changes in real time. This allows you to monitor the strength of a channel as you adjust the antenna for best reception. |

| Caption Menus | |
|---|---|
| | This menu accesses captioning features:<br>• **On/Off** – turn captions on/off – *other options are not available if captions are off.*<br>• **Analog Mode** - CC 1-4 and Text 1-4<br>• **Digital Mode** – Service 1-6<br>• **Digital Font Options**<br>  • **Size** – Standard (15 pixels), Large (21 pixels), or Small (11 pixels)<br>  • **Style** – 1-6<br>  • **Color** – 8 shade of background, foreground and edge colors<br>  • **Opacity –** foreground and background<br>  • **Edge –** 6 style options<br><br>Version displays current version of tuner firmware |
| **V-Chip Settings Menus** | |
| | Manages access to programming for US and Canadian standards.<br><br>The default PIN number for access is **0000** (four zeros. |
| ***Change PIN***<br> | Enter and confirm new PIN for access. |

| | |
|---|---|
| ***US Rating***<br> | Use arrows and Select functions to select level of Movie and TV rating allowed. |
| ***Canada Rating***<br> | Use arrows and Select functions to select level of Movie and TV rating allowed. |
| **Setup Menus** | |
| | This series of menus select the options for tuner operation:<br>• **Screen Format** – 16:9 or 4:3<br>NOTE: Set when tuned to a digital channel, again when tuned to an analog channel – these are two different settings! You can use RATIO on the remote – does the same setting.<br>• **Time**<br>• **Sound Settings**<br>• **Video Noise Reduction** - On/Off (if tuned to analog)<br>Set to On – helps to clean up analog channels<br>• **Menu Language** – English, Spanish, French |

### *Screen Format*

Selects between 4:3 and 16:9 aspect ratios. The Ratio command can also adjust the settings.

- **4:3 Display** offers three options for 16:9 video: 16:9, 4:3 (stretched vertically), and Zoom (cropped sides)
- **16:9 Display** offers three options for 4:3 video: 4:3 (small centered), 16:9 (stretched horizontally), and Zoom (stretched vertically and horizontally) – or 4:3 and 16:9 if the video is 16:9

### *Time*

Sets time settings for:

- **Daylight Saving** – Select and choose on or off
  Note – The DST trigger comes from the broadcast stations, and may not be in sync with the new US standards. Use On/Off or time zone to offset time
- **Time Zone** – Select local time Zone

### *Time Zone*

Use left-right cursors to select the time zone, Select enters the current zone.

### *Sound*

Selects a variety of options, each is only active when you are currently tuned into an analog or digital channel:

- **Analog MTS** – Mono, Stereo, SAP (same as Audio)
- **Multi-Track** – English, French, Spanish
- **Digital Out** – AC-3 (Dolby 5.1), PCM, or variable-level PCM. Set to PCM when using audio through the HDMI connection – most displays cannot decode AC-3 (Dolby 5.1).
- **Auto Volume** – On or off

## Pop-Up Menus

| | |
|---|---|
| ***Info***<br> | Activated from Info command.<br>• **Channel** – Analog or digital, Mode, Name<br>• **Time** – current time and date<br>• **Program** – Times and name (if digital)<br>• **Details** – Resolution, Audio Mode, Captions, Rating |
| ***Guide***<br> | Shows the day's programming guide for current station. Use Up or Down arrows to move through Guide. |

# RS-232 Control Protocol

## Overview

The 232-ATSC+ full duplex RS-232 enables a system programmer to control all TV Tuner functions as well as monitor TV Tuner status. All commands are sent as ASCII strings. No delays between characters or commands are required, as data is interrupt driven and buffered.

The 3 status groups are: Channel/Source Select, Audio Levels/Mode and Front Panel. The Power button-function status from the 232-ATSC+ front panel has been grouped with the Channel/Source for simplicity in the most common modes of operation. Each of the groups has one ASCII status response string containing all of the status data for that group. The current status string of a group is sent from the 232-ATSC+ whenever a valid command for that group is received by the 232-ATSC+ RS-232 port or front panel. A group's status may be requested at any time via the RS-232 port. Status of all 3 groups is sent at power up. The format of each group's status response string remains the same always.

Up to 9 232-ATSC+ units may be cabled together and addressed for individual control from a single RS-232 port. Each 232-ATSC+ is assigned a unique unit code.

Communications parameters (Front Panel Mode 1) are 300 to 19200 baud, 8 data bits, No parity, and 1 stop bit. Factory default is 9600 baud, Unit#1.

All settings are saved to NVRAM in the 232-ATSC.

The tuner will accept non-standard RS-232 control such as voltage that swings from 0 to +5 VDC, commonly found when IR ports are used to send RS-232 commands.

## General protocol specifications

Characters in command strings to the 232-ATSC+ are common ASCII keyboard characters.

Command strings sent to the 232-ATSC+ begin with the ASCII > (greater than symbol) as an 'Attention' character and end with carriage return - ASCII CR, Hex $0D, or keyboard Enter - as an 'End-of-command' character.

Responses from the 232-ATSC+ begin with the ASCII < (less than symbol) as an 'Attention' character and end with a carriage return followed by line feed an ASCII LF or Hex $0A as 'End-of-command' characters.

A carriage return is required at the end of each command and is assumed in all examples.

## Command String Structure

[Attention] (Unit#) [Command] (Parameters) [Return]

| | |
|---|---|
| Attention | Single character (>) starts the string |
| Unit# | The Unit# is expressed as an ASCII 0-9 when used in multiple tuner applications.<br>To address all units, use a Unit # of 0 (Zero)<br>No unit number will default to Unit#1 |
| Command | A two-character command |
| Parameters | Added attributes to some commands |
| Return | A carriage return ends the command string, you may use ASCII CR, Hex $0D, or keyboard 'Enter' in programming. For simplicity, the programming examples in the manual will not show the 'CR' – so remember, you'll need to add it in your control code. |

## Command and Status Response

Commands can be sent back to back at any time without any delay. To allow for rapid, multiple commands, status responses are intentionally delayed by about 125mS, sending the most current status in response to control commands or user actions.

## Control Commands

| Code | Function | Operation |
|---|---|---|
| | **Front Panel** | |
| **S4=** | Set front panel lockout mode | 0=None<br>1=Channel<br>2=Volume<br>3=Channel & Volume<br>4=Power<br>5=Channel & Power<br>6=Volume & Power<br>7=All |
| **Q5=** | Set IR Receive mode | 0 - No IR reception<br>9 - CR 9 (Default) |
| **KK=105** | Menu | Opens on-screen menus |
| **KK=106** | Arrow Right | Arrow Left |
| **KK=107** | Arrow Left | Arrow Down |
| **KK=108** | Arrow Up | Arrow Up |
| **KK=109** | Arrow Down | Arrow Down |
| **KK=110** | Enter | Enter |
| **KK=111** | Exit | Exits menus |
| **KK=95** | List | Displays on-screen list to select favorite channels |
| **P1** | Power On | On |
| **P0** | Power Off | Standby, mutes audio and video |
| **PT** | Power Off/On | Power toggle |
| **XX** | Power On | On (same as 232-series Mute Off) |
| **XM** | Power Off | Standby (same as 232-series Mute On) |
| **XT** | Power Off/On | Power toggle (same as 232-series Mute Toggle) |
| | **Tuning** | |
| **TC=** | Select tuned channel | Tunes analog and digital channels, leading zeros OK, up to 4 characters for analog or single-unit digital channel, 3 characters for major and minor channels.<br>*Examples:* '>TC=28:1' Selects channel 28-1<br>'>TC=28-2' Selects channel 28-2<br>'>TC=32' Selects 32-1, 32-0 if no digital<br>'>TC=32-0' Selects analog channel |
| **TU** | Tune channel up<br>*Example:* '>3TU' | Selects next higher channel in channel list<br>Bumps Unit#3 tuned channel up |
| **TD** | Tune channel down | Selects next lower channel in channel list |
| **TP** | Previous channel | Selects previously viewed channel |
| **T^** | Start Channel Scan | Initiates new channel scan for analog and digital channels, scan operation set by D0 and S0. |
| **S0=** | Tuning Format | 0=CATV (Default) - Switches to Cable, sets scan mode<br>1=Off-Air - Switches tuner to Air RF input and channels<br>2=IRC - Switches to Cable, sets scan mode<br>3=HRC - Switches to Cable, sets scan mode<br>4=Cable Auto - Switches to Cable, sets scan mode |
| **D0=** | Set Channel Scan Mode | Sets scan mode for digital and analog channels from the T^ or front panel scan command.<br>0= Scans for analog and digital channels scan (default)<br>1= Scans for digital only, deletes analog channels<br>2= Scans for digital only, keeps analog channels<br>3= Scans for analog only, deletes digital channels<br>4= Scans for analog only, keeps digital channels<br>A scan must be triggered by T^ or front panel before the onscreen Menus will scan following D0 rules. |
| **XD=** | Channel delete | XD=<major>,<minor> removes channel from channel list.<br>*Example:* '>XD=0,0' removes current channel |
| **XA=** | Channel add | XA=<major>,<minor>,<physical> adds channel<br>*Example:* '>XA=38,1,0' Physical channel will be same as major |
| **KK=153** | Air | Sets tuner for antenna (Off-Air) tuning |
| **KK=154** | Cable | Sets tuner for cable tuning |
| **KK=88** | Favorite | Steps through favorite channels (selected in List menu) |

| Code | Function | Operation |
|---|---|---|
| | **Display** | |
| **KK=149** | RGB Out | Selects RGB output and colorspace |
| **KK=151** | YPbPr Out | Selects Component (YPbPr) output and colorspace |
| **D4=** | Overscan (0-9)% | Removes upper scan lines that may appear in RGB output, affects all outputs, 0% is default setting.<br>*Example:* '>D4=3' Overscan by 3% (typical solution) |
| **KK=82** | Ratio | Steps through aspect ratios, options depend on channel and output types |
| **KK=81** | Signal | Displays signal Strength |
| **KK=100** | Info | Launches on-screen information window |
| **KK=63** | Guide | Displays Electronic Program Guide |
| **KK=115** | CC – Closed captions | Steps through captioning options |
| **Q0=** | Caption Mode Off (0-2)<br><br>Example: '>Q0=0' or '>Q00' | Sets captioning mode<br>0=Captioning off (default)<br>1=Captioning on<br>Captioning off |
| **Q1=** | Captioning Type (1-8) | Turns on captioning type<br>1=Caption 1 (normal setting for most captioning)<br>2=Caption 2<br>3=Caption 3<br>4=Caption 4<br>5-8= Text 1-4 (rarely used) |
| **Q7=** | Digital Caption Service | Set to 1-6 (1 is default) |
| | **Audio** | |
| **VU** | Ramp volume up | Starts volume ramping up |
| **VD** | Ramp volume down | Starts volume ramping down |
| **VH** | Sets volume level 0-100 | Volume level, scaled in 100 steps |
| **VL** | Sets volume level 0-63 | Volume level, scaled in 63 steps, as other 232 tuners |
| **VX** | Volume Mute off | Restores audio volume to previous level |
| **VM** | Volume Mute on<br>***Example:*** '>VM' | Turns off audio outputs<br>Mutes audio outputs |
| **VV** | Stop volume ramp | Stops volume ramping |
| **VT** | Toggle Volume Mute | Alternates audio mute on and off |
| **DL=** | Set Power-Up volume | 0-63 |
| **KK=85** | Audio Mode | Step through audio mode options for mono, stereo, SAP |
| | **Status Request** | |
| **SQ** | Request Q Mode status | Unit sends "Q" Mode status string |
| **SS** | Request Front Panel status | Unit sends "S" Front Panel status string |
| **ST** | Request Channel status<br>*Example:* '>ST' | Unit sends "T" Channel/Source status string<br>Returns Channel/Source status response string |
| **SV** | Request AV status | Unit sends "V" Audio status string |

A carriage return is required at the end of each command and is assumed in all examples. The '=' sign for parameters may be omitted if desired, though it is helpful for clarity in checking programming.

## Terminal Communication Commands

| | | |
|---|---|---|
| **EF** | Echo Off | Characters received will not be re-transmitted (power up default). |
| **EN** | Echo On | Characters received will be re-transmitted.<br>*Example:* '>EN' Characters received will be re-transmitted. |
| **ID** | Product ID | Returns the product model number and firmware version. |
| **Z!** | Zap | Reconfigures unit for all factory default settings. |

## HD2-RC Remote Emulation

You can also emulate IR commands sent from the CR HD2-RC Wireless Remote. If you are using the numeric keys to select a channel, the user or program will need to follow the numeric command with an Enter.

.

| **KK=<key>** | * = Reserved for future products/applications | |
|---|---|---|
| | 0=* | 88=Favorite |
| | 1=* | 95=List |
| | 2=* | 96=Add/Delete Channel |
| | 3=* | 98=Air/Cable |
| | 4=* | 99=Dash - |
| | 5=* | 100=Info |
| | 6=* | 101=Prev Chan |
| | 7=* | 105=Menu |
| | 8=* | 106=Cur Right |
| | 9=Power (tog) | 107=Cur Left |
| | 10=0 | 108=Cur Up |
| | 11=1 | 109=Cur Down |
| | 12=2 | 110=Enter/Select |
| | 13=3 | 111=Exit |
| | 14=4 | 115=CC |
| | 15=5 | 141=Format 1080i |
| | 16=6 | 142=Format 720p |
| | 17=7 | 143=Format 480p |
| | 18=8 | 144=Format 480i |
| | 19=9 | 149=Output RGB |
| | 20= | 151=Output YPbPr |
| | 21=Enter/Select | 153=Air |
| | 22=Ch Up | 154=Cable |
| | 23=Ch Dn | 155=16:9 Ratio Pillar Box<br>4:3 Ratio Letterbox |
| | 24=Vol Up | 156=16:9 Ratio Full Wide<br>4:3 Ratio Full |
| | 25=Vol Dn | 156=16:9 Ratio V Zoom<br>4:3 Ratio H Zoom |
| | 26=Vol Mute (tog) | 158=AC-3(Dolby 5.1) |
| | 27=Power On | 159=PCM |
| | 28=Power Off | 160=PCM Variable |
| | 29=Menu | 161=Display 16:9 |
| | 63=Guide | 162=Display 4:3 |
| | 80=Freeze | |
| | 81=Signal | |
| | 82=Ratio | |
| | 85=Audio | |

# Response Strings

## Response Strings

Typical: [Attention] [Unit#] [data ...data] [cr] [lf]

232-ATSC+ status response strings contain ASCII characters similar to those used for the same functions in command strings. An ASCII 'carriage return' and 'line feed' follow each response string. Functions shown as N/A are not applicable or available in the 232-ATSC; characters will appear in status strings as lower-case x.

### *Channel/Source Status Response String (T):*

| Start | # | CMD | Power | Major Channel | Video Mute | Input | RF | Received Resolution | Minor Channel | NA | Function |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-9 | | U=On<br>M=Off | 3 digits | Un-muted | 0=RF | A=Air<br>C=Cable | 0=1080i<br>1=720p<br>2=480p<br>3=480i<br>N=No Sig | 3 digits | | 0=None |
| **<** | **1** | **T** | **U** | **032** | **U** | **0** | **A** | **0** | **002** | **x** | **0** |

For compatibility with 232-series tuners, the 232-ATSC+ channel status is split into Major Channel and Minor Channel sections. The Minor Channel will always be 000 for analog channels. With version 1.9, the Minor Channel status will display "F00" if the Major channel is a special "one-part" digital channel. Also, as one-part channels can go higher than 999, the Minor status will tell you how many thousands (up to 63) you add to the Major number. So, channel 1032 would show 032 Major F01 Minor. Two-part channels are limited to 999-999.

### *Audio Status Response String (V):*

| Start | Unit | CMD | Power | Volume 1 | Volume Mute | Stereo | Volume 2 |
|---|---|---|---|---|---|---|---|
| | 1-9 | | U=On<br>M=Off | 0-63<br>Emulated level<br>2 digits | U=Unmuted<br>M=Mute | N/A | 0-100<br>Actual level<br>3 digits |
| **<** | **1** | **V** | **U** | **63** | **U** | **x** | **100** |

Volume 1 emulates 232-series volume level for compatibility with existing applications.
Volume 2 shows actual 232-ATSC+ level, from 0-100 steps. In V 1.9, Mute status will be sent if a user mutes volume from an IR remote

### *Front Panel Mode Status Response String (S):*

| Start | Unit | CMD | Audio | Tune Mode | Lockout | Bass | Treble | Output | Output Resolution | Output Setting | NA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-9 | | N/A | 0=Cable<br>1=Air<br>2=IRC<br>3=HRC<br>3=Auto | 0-7 | Fixed<br>2 digits | Fixed | 0=RGB<br>2=YPbPr | 0=1080i<br>1=720p<br>2=480p<br>3=480i | 0=1080i<br>1=720p<br>2=480p<br>3=480i | 4 digits |
| **<** | **1** | **S** | **x** | **1** | **0** | **08** | **4** | **2** | **0** | **0** | **xxxx** |

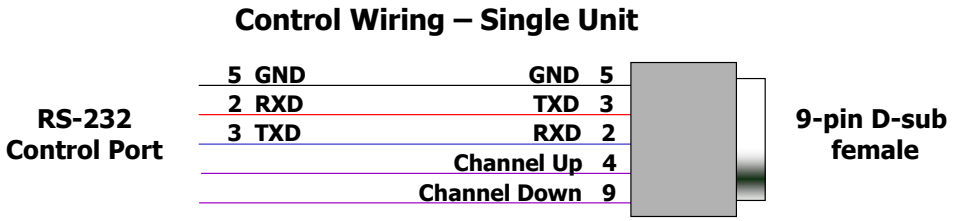
Current Ratio is the actual output ratio; Ratio Mode is the selected mode (see chart on page 9)

### *Q Mode Response String (Q):*

| Start | Unit | CMD | Q0 | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | NA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-9 | | CC<br>0=Off<br>1=On | CC<br>Type<br>1-8 | Video Detect (fixed) | AV Detect (fixed) | Label (fixed) | IR<br>0=Off<br>9=Normal | 1 digit | Digital CC 1-6 | 2 digits |
| **<** | **1** | **Q** | **1** | **1** | **3** | **0** | **2** | **9** | **0** | **1** | **xx** |

# RS-232 Cable Connections

### Single Tuner

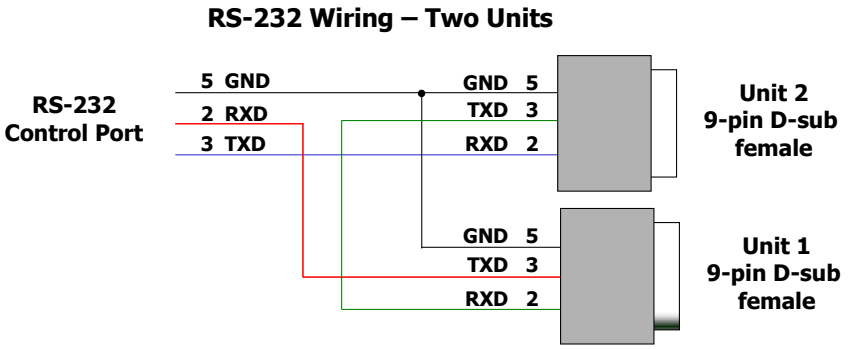


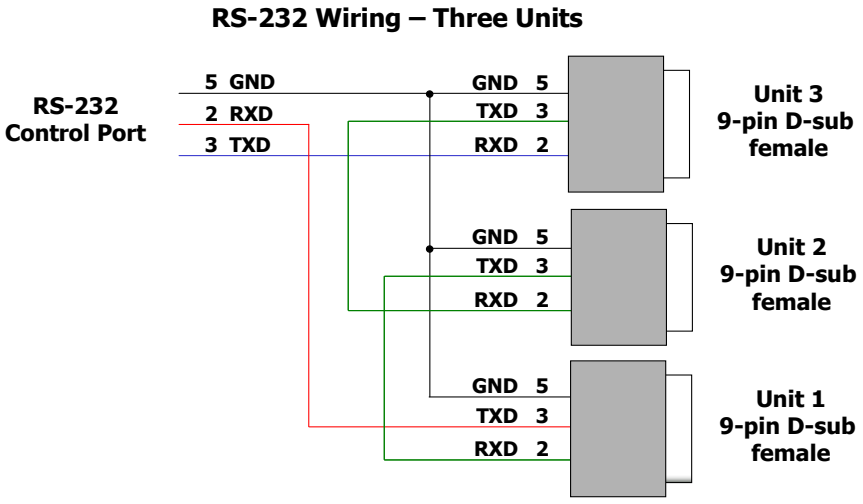

RS-232 wiring for control or programming should only use pins 2, 3, 5. Cables with all pins wired can lock out front-panel programming and data communication (Pins 4 and 9 are inputs).

### Multiple Tuners

Up to nine tuners can be daisy-chained from one RS-232 control port. Remember that you will need to use the Unit# address in your programming when you control more than one tuner from the same control port.

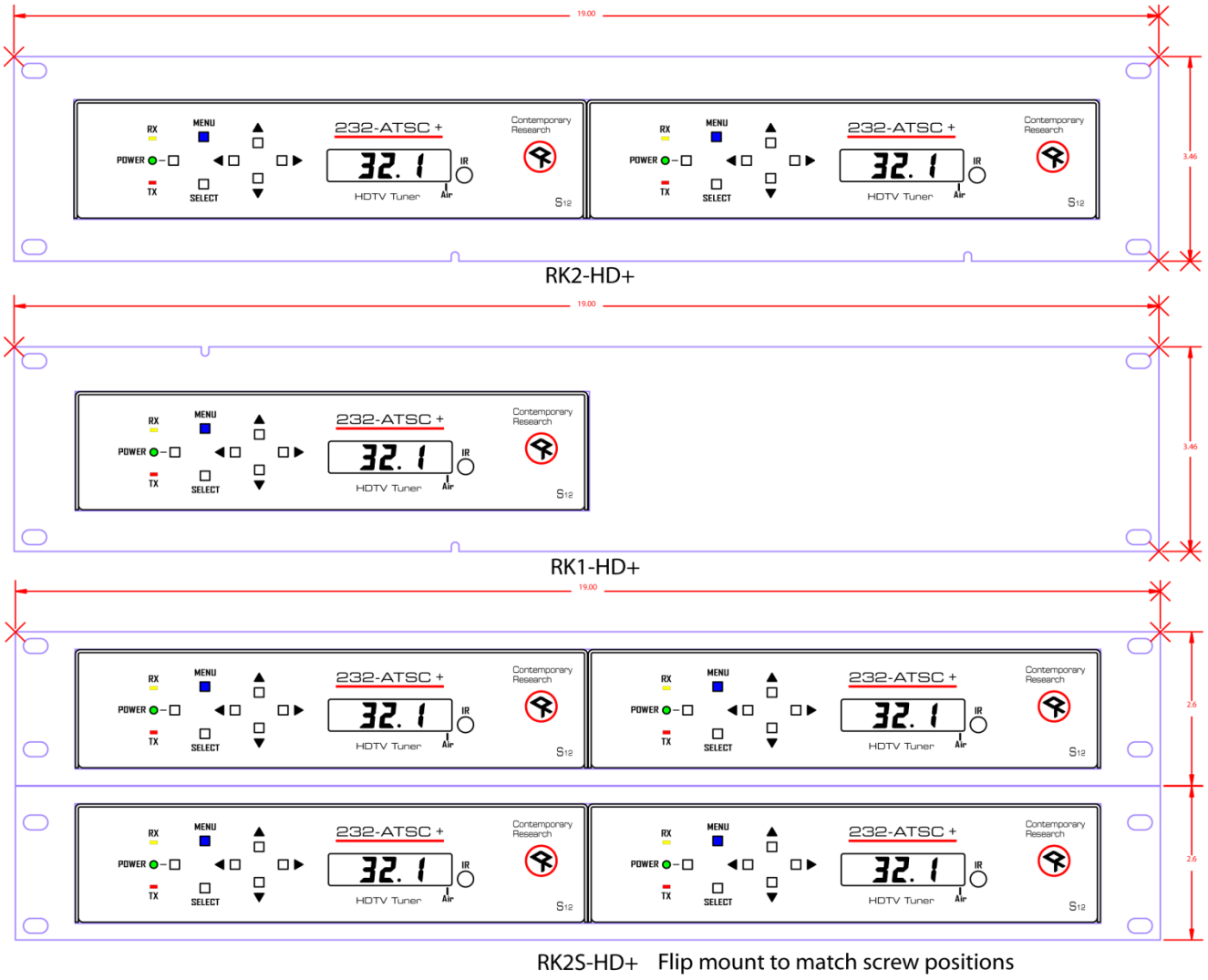
Set the first unit in the RS-232 chain to the highest Unit#, then wire in sequence to the last tuner in the chain. The reason for this is that CR tuners use an intelligent data bus - the highest number tuner receives all commands, and then passes on commands addressed to tuners with lower unit numbers. The next tuner in the chain does the same, and so on until the last unit.



# Rack Mounting

Three options are available for rack-mounting tuners.




**RK1-HD+**

- Insert 232-ATSC+ into RK1-HD frame.
- Use screws included with kit to attach tuner to the side flanges.

**RK2-HD+**

- Use supplied screws to attach left tuner to left and top flanges
- Use supplied screws to attach right tuner to right and top flanges

**RK2S-HD+ Space-Saver Rack Kit**

- Use supplied screws to attach left tuner to left and top flanges
- Use supplied screws to attach right tuner to right and top flanges
- Mount the first rack, then flip the next rack kit upside down, add tuners and mount
- With this method, you can mount 4 tuners in 3 rack spaces

# Safety Instructions

**Read before operating equipment.**

1. Cleaning - Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

2. Power Sources - Use supplied or equivalent UL/CSA approved low voltage DC plug-in transformer.

3. Outdoor Antenna Grounding - If you connect an outside antenna or cable system to the product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.

4. Lightning - Avoid installation or reconfiguration of wiring during lightning activity.

Power Lines - Do not locate an outside antenna system near overhead power lines or other electric light or power circuits or where it can fall into such power lines or circuits. When installing an outside antenna system, refrain from touching such power lines or circuits, as contact with them might be fatal.

5. Overloading - Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.

6. Object and Liquid Entry - Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts, resulting in a fire or electric shock. Never spill liquid of any kind on the product.

7. Servicing - Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

8. Damage Requiring Service - Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
   - When the power supply cord or plug is damaged.
   - If liquid spills or objects fall into the product.
   - If the product is exposed to rain or water.
   - If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions. An improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
   - If the video product is dropped or the cabinet is damaged.
   - When the video product exhibits a distinct change in performance, this indicates a need for service.

* Note to CATV system installer: This reminder is provided to call CATV system installer's attention to Article 820-40 of the National Electrical Code (Section 54 of Canadian Electrical Code, Part I), that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building as close to the point of cable entry as possible.

# Limited Warranty

Contemporary Research Corporation (CR) warrants this product to be free from defects in material and workmanship under normal use for a period of two years from the date of purchase from CR. Should such a defect occur CR will repair or replace, at their option, the defective product at no cost for parts or labor.

This warranty extends to product purchased directly from CR or an Authorized CR Dealer. Consumers should inquire from selling dealer as to the nature and extent of the dealer's warranty, if any.

All warranty claims must be shipped pre-paid to the factory. Call or fax to obtain a Return Material Authorization (RMA) number.

CR is not liable for any damages caused by any of its products or for the failure of any products to perform, including any lost profits, lost savings, incidental damages, or consequential damages. CR is not responsible for any claim made by a third party or made for you by a third party. This limitation of liability applies whether damages are sought, or a claim is made, under this warranty or as a tort claim (including negligence and strict product liability), a contract claim, or any other claim. This limitation of liability cannot be waived or amended by any person. This limitation of liability will be effective even if CR or an authorized representative of CR has been advised of the possibility of any such damages.

Some states do not allow a limitation of how long an implied warranty lasts. Some states do not allow the limitation or exclusion of incidental or consequential damages for consumer products. In such states, the limitation or exclusion of the Limited Warranty may not apply to you. This Limited Warranty gives you specific legal rights. You may also have other rights that may vary from state to state. You are advised to consult applicable state laws for a full determination of your rights.

Except as expressly set forth in this Limited Warranty, CR makes no other warranties, expressed or implied, including any implied warranties of merchantability or fitness for a particular purpose. CR expressly disclaims all warranties not stated in this Limited Warranty. Any implied warranties that may be imposed by law are limited to the terms of this Limited Warranty.